



OAKVILLE

## REPORT

COMMUNITY SERVICES COMMITTEE

MEETING DATE: JULY 14, 2014

---

**FROM:** Parks and Open Space Department

**DATE:** June 15, 2014

**SUBJECT:** Harbours Sediment Management Study

**LOCATION:** Oakville & Bronte Harbour

**WARD:** 1,2,3

Page 1

---

### RECOMMENDATION:

That the report from the Parks and Open Space department entitled Harbours Sediment Management Study dated June 15, 2014, be received.

### KEY FACTS:

The following are key points for consideration with respect to this report:

- The sediment management study was a key recommendation from the Oakville Harbours Financial Strategic Management Plan: Review the sediment deposition in Bronte and Oakville harbours that requires expensive periodic dredging to maintain recreational boating in the harbours.
- The consulting firm GHD was engaged for the study. A Technical Advisory Committee composed of Town staff, Conservation Halton staff, and a representative from the Association of Oakville Harbours Stakeholders lead the study.
- Sediment deposition in Bronte harbour is approximately 3500 cubic meters per year and Oakville harbour is 1700 cubic meters per year.
- The exact contribution of sediment deposition from development and construction activity versus natural runoff from watersheds cannot be determined and this conclusion is explained in detail in the technical report.
- The study reviewed opportunities to reduce sediment generation and supply from the watersheds due to construction and development activity and concluded the focus should be on compliance rather than new technologies and techniques, monitoring levels should be continued or increased, focus should include erosion control in addition to sediment control, and methods to reduce agricultural inputs should be explored.
- The study determined that due to the large watersheds and the potential supply of sediment from unregulated non-point sources, it would be difficult to reduce the upstream sediment supplied to the harbours.

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

---

- Management options focused on what could be done within the harbours themselves based on effectiveness, environmental impacts, adaptability, feasibility and cost.
- Preferred options include continuing the periodic dredging (Bronte harbour every 7 years and Oakville harbour every 10 years), or moving to maintenance dredging consisting of smaller more frequent dredging that is targeted based on annual bathymetric soundings and an adaptive management approach.
- The study recommends maintenance suction dredging, which may be more expensive, but is beneficial in terms of harbour usability, safety and decreased environmental impacts.
- A large dredge is recommended for Bronte harbour in 2014-2015 as the priority and then moving towards annual maintenance dredging programs for both harbours.
- The sediment management study is one of the primary inputs into the development of a Harbours Master Plan, scheduled for 2015, subject to budget consideration.

## **BACKGROUND:**

Both Oakville harbour and Bronte harbour are located on the shoreline of Lake Ontario, with recreational mooring facilities in the mouths of the Sixteen Mile Creek and the Bronte Creek respectively. Sediment is carried by the creeks and their tributaries contributed by natural processes from the watersheds into the harbours and out into the lake. A portion of this sediment is deposited within the harbours and interferes with harbours' operations. Periodic dredging of both Oakville harbour and Bronte harbour has been standard practice for many years.

Dredging is the largest capital cost expenditure for the harbours section. Over the years the cost of dredging has increased for a number of reasons including a shrinking number of contractors who perform the work. In 2010-2011 Parks and Open Space and Finance staff, with the assistance of the firm Hemson Consulting Ltd. undertook a comprehensive financial review of the Harbours section. The Hemson report, Oakville Harbours Financial Strategic Business Plan was received by Council in January 2011. In the Hemson study it was noted, *In light of the importance of dredging to the harbours and the scale of costs involved it is further recommended that a detailed review can be undertaken of the dredging issue.*

The Harbours Financial Strategic Business Plan was reported to Council on several occasions prior to January 2011 as staff further investigated and consulted with stakeholders on issues pertaining to the financial plan. However, a further review of dredging was a fundamental recommendation arising from the Hemson study. At the

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

September 20, 2010 Council Meeting several resolutions regarding the Financial Strategic Business Plan were approved that included;

*That funding for a Sediment Management Study be referred to the 2011 Budget Committee*

Based on Council direction, staff has undertaken a Sediment Management Study and through this report is advising Council of the investigation and research that was done along with the study recommendations. The report provides a summary of the sediment management study and recommendations. An Executive Summary is attached to this report. Since the report is very lengthy and technical in nature, copies are available within the Parks and Open Space department should a Member of Council wish to review the full technical study. The entire technical study is available on-line for the public along with the report at [Oakville.ca](http://Oakville.ca)

#### **COMMENT/OPTIONS:**

To ensure that the Sediment Management Study would be comprehensive in scope, a Technical Advisory Committee (TAC) was assembled to develop the terms of reference for the engagement of a consultant. The TAC also lead the study. Members of the TAC included:

- Town staff from the departments of Parks and Open Space, Development Engineering, Environmental Policy and Engineering and Construction
- Staff from Conservation Halton
- Member from the Association of Oakville Harbour Stakeholders (AOHS)

The TAC recommended the firm GHD be awarded the study based on the submissions received through the Town's request for proposal purchasing process. GHD was tasked with developing a sediment management strategy to review sediment deposition, sources of sediment and options for mitigation within Bronte and Oakville harbours. The TAC met with the consultant on many occasions during the study, hosted 2 public meetings and reviewed/approved the final report and recommendations.

The sediment study consisted of two (2) components;

1. Investigation of the sources of sediment within the watersheds as well as options to reduce the sediment supply from development and construction activities; and
2. Investigation of the processes of deposition at the harbours and development and assessment of options to mitigate or manage sediment deposition and removal.

Developing the study required the following tasks:

- Detailed background and literature review;
- Targeted field assessment;
- Desktop analysis of harbour evolution;
- Bathymetric change analysis to determine locations and rate of sediment deposition;
- Focused interviews with municipal and agency staff as well as stakeholder representatives;
- Public consultation through two open house meetings; and
- Development and evaluation of options to mitigate sediment deposition.

### Background Review

The background review included identifying natural heritage features and ecological functions of the harbours. Typical harbour impacts on ecology, flooding and water quality were investigated through a review of literature and available flood models. The history of development within the watersheds was summarized to provide context for the assessment of sediment sources. Construction practices and erosion and sediment control guidelines were reviewed to provide a basis for determining mitigation options within the watersheds.

Existing information, desktop analysis and field data collection were used to summarize the historic changes at the harbours including locations and rates of deposition at critical points within the harbours. Sediment was deposited in areas where the flow velocity decreased resulting in a reduction of the transport capacity of the flow. The deposited sediment in both harbours consisted of fine sands, silts and clays.

### Natural/Historic Context

Sediment movement through watersheds is a natural process involving zones of sediment generation, transport and deposition. The headwaters, tributaries and main branches of Bronte and Sixteen Mile Creeks are mainly zones of sediment generation and transport. The mouths of the creeks are natural areas of sediment deposition due to the decrease in slope, widening of the channels and backwater effects of the lake which decrease flow velocity causing sediments to be deposited.

In their pristine conditions, before the harbours were constructed, the harbour sites were likely shallow marshlands which provided important ecological functions. It is also likely that at times these areas were almost inaccessible from the lake as a result of natural sediment deposition and then the natural vegetation of these

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

---

deposits. The harbours are man-made features located in an area where sediment is naturally deposited by the watershed.

### Rate of Deposition

The study confirmed that sediment deposition within Bronte harbour mainly occurs within the meander bend as Bronte Creek turns sharply to the east just downstream of the bridge on Lakeshore Road West. Other areas of deposition include the central portion of the harbour, the west branch of the harbour, and to a lesser extent, the outer harbour. The rate of sediment deposition within Bronte harbour is approximately 3,500 cubic meters per year.

In Oakville harbour, sediment deposition consists of an accumulation of bedload and suspended load at Oyster Bay (just south of the Oakville Yacht Squadron) as the river flow spreads out within the wider harbour area and flow velocities decrease. Sediment is also deposited within the area occupied by the Oakville Power Boat Club and lagoon area at Shipyard Park. The rate of accumulation of deposited sediment within Oakville harbour is approximately 1700 cubic meters per year.

An issue that was top of mind at the outset of the study was the need to understand the difference in dredging periods between Bronte harbour and Oakville harbour. For the last several dredges Bronte harbour has required dredging every 7 years, whereas Oakville requires dredging every 10 years. From the study it is clear that sediment accumulates at a higher annual rate in Bronte harbour than in Oakville harbour.

The relative contribution of sediment from different land uses was investigated as well as potential causes for the perceived increase in rate of sediment deposition at Bronte harbour. Dredging was required every 7 years for the past 22 years, versus every 10 years previous to that period. Dredge volumes prior to 1992 were not available so it was not possible to determine if there was a change in the rate of sediment deposition prior to that time. After analysis of sediment contributions it was concluded that the potential increase in sedimentation rate was not likely due to increased development within the watershed. Most development in the past three decades occurred within the Sixteen Mile Creek watershed whereas there was no apparent increase in sediment deposition downstream within Oakville harbour.

### Development Contribution to Sedimentation within the Harbours

Over the years it has been the opinion of some that dredging the harbours is linked to upstream development, ie. development and runoff from construction sites is contributing to the sediment deposition, and rate of deposition within the harbours. Despite the fact the town has developed stormwater management ponds in full

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

---

compliance with the Ministry of the Environment, and implemented best management practices at stormwater management ponds, that opinion has lingered.

As part of the sediment study a conceptual exercise was conducted to compare the potential sediment yield from new construction within the watersheds to sediment yields from existing agricultural land. In both watersheds, the area of agricultural land was much greater than the potential urban growth area, resulting in much greater potential soil loss and therefore contributions of sediment from the agricultural land, than construction sites for any given soil loss rate. The exact proportions of contributions could not be determined; however improved erosion and sediment control planning, implementation and compliance ie. involving inspections and enforcement would reduce the supply of sediment from construction sites.

### Public Consultation

The sediment study included two (2) public open houses that were used to inform stakeholders about the study, advise of the findings, and seek feedback/information from interested stakeholders. On both occasions, a presentation was followed by question and answer periods. A separate meeting was convened with AOHS to address their specific concerns in more detail.

### Recommendations to Reduce Natural Sediment Runoff and Construction Related Inputs

From the investigation and research undertaken during the study, the following recommendations are provided with respect to reducing sediment generation and supply from watersheds due to development and construction activities;

- The focus should be on compliance rather than new technologies or techniques.
- Monitoring of compliance should be maintained at current levels or increased.
- The implementation of existing technologies could be improved.
- There should be a focus on erosion control in addition to sediment control.
- Methods to reduce agricultural inputs should be explored (ie. vegetated buffers, tillage methods and other farming practices).

### Options to Manage Sediment Deposition

The sediment study analysis indicates that given the large watersheds and potential supply of sediment from unregulated non-point sources, it would be difficult to reduce the sediment supplied to both harbours. The study therefore focused on management options that could be applied within the harbours themselves. In order

to manage sediment deposition within the harbours, the following options were investigated;

- Installation of soft structures;
- Installation of hard structures;
- Use of sediment traps;
- Operational changes;
- Current dredging practice;
- Development of a maintenance dredging program;
- Purchase of a suction dredger;
- Relocation of harbours; and,
- Disposal of sediment offshore.

These options were evaluated based on their effectiveness, environmental impacts, adaptability, feasibility, and cost. It should be noted that not all options are mutually exclusive and more than one option could be implemented. Summaries of the option evaluations are provided within the Executive Summary appended to this report.

#### Preferred Options for Sediment Mitigation

- The current dredging practice that consists of a large dredge at Bronte harbour every 7 years and every 10 years at Oakville harbour; or
- A maintenance dredging program which consists of smaller, more frequent dredge operations targeting sail boat operating depths.

#### Recommended Option

The recommended option is an annual maintenance dredging program. While the maintenance dredging may be slightly more costly than the current practice of less frequent larger dredges, there is an added benefit of increased harbour usability, safety and decreased environmental impacts with an annual program to attain depth required for recreational boating

The recommended sediment management strategy is for one large dredging operation within Bronte harbour in 2014-2015 followed by smaller dredging operations in alternate years in each harbour. The method of sediment removal in Bronte harbour would need to be determined through engineering considerations and constraints such as timing, weather and availability of space. It is recommended the smaller maintenance dredge operations be conducted using a suction dredge with geotube processing of the sediment once removed as it is the least impactful dredging option. Exact volumes and locations will be determined through an adaptive management approach based on annual bathymetric soundings.

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

---

## Conclusion

The Sediment Management Study involved a review of sediment deposition and transport within Oakville and Bronte harbours, as well as investigation into sediment management options. While the study was originally envisioned to be primarily a desktop exercise, field assessments as well as extensive bathymetry and soundings in both harbours were integrated into the project to ensure the study was as thorough and comprehensive as possible. While this added time and slightly more cost for the study, the TAC strongly agreed the additional field work and scientific investigation would yield evidence based analysis and recommendations.

During the course of the study, harbours staff undertook a *pilot* hydraulic dredge in Bronte harbour. With the support and assistance of the Bronte Harbour Yacht Club, a suction dredger removed sediment that was pumped into a geotube bag, (long plastic bag that allows water to drain but retains the sediment through introduction of polymers). Once the water had drained, moist sediment was removed and transported to the closed Fourth Line landfill. While the pilot suction dredging operation was very much a learning experience, it did prove that suction dredging is quite feasible and can be conveniently done within the harbours.

Noted within one of the mitigation options is the purchase of a suction dredger. This is a costly piece of singular use equipment. During the sediment study staff became aware that the Town of Cobourg has the same suction dredger suggested as a management option for Oakville. Cobourg staff has visited both Oakville and Bronte harbours and on a fee for service basis is interested in undertaking maintenance dredging as required. It is staff's intent to pursue this partnership with the Town of Cobourg before any further thought is given to purchasing a suction dredger for Oakville. Annual dredging may not be the least cost option, but it would be much more targeted and ensure the harbours are maintained to a constant recreational boating depth without waiting for the timing of larger, more robust and intrusive and disruptive dredging events.

Dredging is the largest cost expenditure for the Harbours section. The sediment management study is one of the major inputs into a Harbours Masterplan that is scheduled for 2015, subject to budget consideration.

## **CONSIDERATIONS:**

### **(A) PUBLIC**

The public was informed about the sediment management study through invitations to open houses where information on findings and draft recommendations were shared with the public. The Association of Oakville

From: Parks and Open Space Department  
Date: June 15, 2014  
Subject: Harbours Sediment Management Study

---

Harbour Stakeholders was a TAC member and meetings were held with key stakeholders such as Conservation Halton and other municipalities.

**(B) FINANCIAL**

There are no financial implications associated with this report at this time. On a go forward basis, annual maintenance dredging will require changes to the Harbours budget. Finance staff and Parks and Open Space staff will collaboratively determine those costs and make appropriate amendments to be presented as part of the annual budgeting process.

**(C) IMPACT ON OTHER DEPARTMENTS & USERS**

This sediment study and report has been prepared with the assistance of the Development Engineering, Environmental Policy, Engineering and Construction departments. The Association of Oakville Harbour Stakeholders also provided valuable assistance.

**(D) CORPORATE AND/OR DEPARTMENT STRATEGIC GOALS**

This report addresses the corporate strategic goal to:

- continuously improve our programs and services
- be accountable in everything we do

**(E) COMMUNITY SUSTAINABILITY**

Oakville is known as a waterfront community and recreational boating is synonymous with the Town. The sediment management study is important in the development of options to mitigate sediment depositions within the harbours so they may continue to be usable, viable and an important resource for our community. This work upholds the environment, economic and cultural pillars of sustainability.

**APPENDICES:**

Appendix A – Executive Summary: Sediment Management Study

Submitted and Prepared by:  
Christopher Mark  
Director, Parks and Open Space